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Pathways towards an Energetic Refurbishment Replication Strategy for Eastern European Countries - Findings from the EU project BEEM-UP

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Abstract: *The goal of significantly increasing the energetic performance of multifamily buildings through effective retrofit measures has been proven to be feasible in three pilot sites in the Netherlands, Sweden and France in the BEEM-UP project. Further development of the project would naturally be to seek ways towards implementation of the gained experience on an even bigger scale, namely Eastern European countries with a large energetic refurbishment potential. However, the European Union comprises of countries of various stages of economic development, social-cultural values and environmental framework conditions so that the strategies discovered need to be translated to the specific national context.*

The goal of this paper is to evaluate seven countries from Eastern Europe by collecting and condensing information to great levels of abstraction, divided into seven major categories. The paper concludes on the major barriers towards energy efficiency and proposed a concrete strategy on how to overcome them.

Refurbishment, Eastern Europe, strategies, energy efficiency

1. Introduction and Scope

The potential to which the European building stock has to contribute to the reduction of CO_2 emissions is considerable, which is even more obvious when compared to the other continents (Table1).

	Population 2010	Land area (km)	Building Floor Space
EU27	501 million	4,324,782	24 billion m²
US	309 million	9,826,675	25 billion m²
China	1338 million	9,598,080	35 billion m²

Table1: Building gross floor space in the EU27, United States and China [1]

Although conforming to same legislation and comprising a unified market, European countries widely differ among each other and so do their building stocks. Therefore researches in the field of energy efficiency (EE) divide the European Union (EU) into three regions- North/West, South, Central/East. Within the BEEM-UP project [2], funded within

the FP7 Research Framework of the EC, it has been demonstrated that through coordinated and ambitious EE measures the final energy demand of multifamily buildings for heating, warm water and electricity could be reduced by 75%. This has been shown in three case studies in the Netherlands, France and Sweden, all situated in the Northern/Western part of Europe. It is obvious that the countries in Central/Eastern Europe, a region with ca. 3566 Mio. m² have a lot in common – linguistically, historically, economically but the question remains what the replication potential of the three BEEM-UP case studies would be if they would be applied to the Eastern European building stock. Thus, the goal of the paper presented is to evaluate seven countries from the region (Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovak Republic, and Slovenia) by collecting and condensing to great levels of abstraction an extensive amount of information, divided into seven major categories (General information, Hardware, Softtware, Orgware, Finware, Ecoware, Polware) and to clearly conclude on the major barriers towards energy efficiency in these countries. Finally the paper proposes a concrete strategy on how to overcome the barriers identified.

2. Methodological approach

The methodological approach focuses on extracting and generalizing to a high degree of abstraction the most essential statements found in an extensive amount of documents, gathered through vast collaboration with various specialists form the target countries in various fields and an intensive desk research.

A valuable method to evaluate both the expert statements and the various text materials are the Qualitative-Content Analysis QCA [3] and the Strength, Weakness Analysis (SWA). Main feature of the adapted QCA from Mayring in this paper is the hexagonal model describing requirements for refurbishment through six categories: Hardware, Software, Orgware, Polware, Finware, Ecoware (Figure 1).

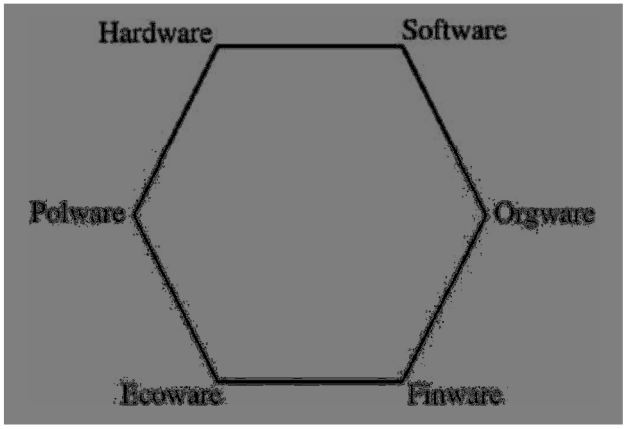

Figure 1 The Qualitative-Content Analysis according to [3]. Hexagonal typology for the analysis of requirements and constraints of indicator development/ implementation [4, p. 73]). These characteristics included, for example, detailed descriptions of accomplished refurbishment measures in combination with statements why an expert considers this process to be an asset or a disadvantage.

Two QCA have been conducted - the first one developed good - practices' factors, further used for a Strength- Weakness Analysis (SWA) and the second one aimed to reduce the material, concerning the characteristics of the country refurbishment activities.

3. Findings by Countries

Introduction data

Each country is introduced first with data on population, population density, heated floor area per m², state of the electricity and heat production mix, in order to provide the general framework of the country to be assessed. The population in the seven countries varies between ~2'000'000 (Slovenia) and ~ 38'500'000 (Poland).The total population of the seven target countries sums up to 93'732'505 inhabitants, which represents roughly 18,5 % of the EU28 population (505'665'739). The density (in people per km² is between 93.18 (Romania) and 135.89(Czech Republic) with the exception of Bulgaria - 69.40. For comparison, the average EU28 population density is appr. 112 [5]. The CO_2 emission per useful floor area is shown on Figure 2 [6]. The energy mix for heating consumption in Central /East Europe consists of 41% coal 29% district heating, 20% biomass, 7% gas, 3% oil and 1% electricity [1, p. 46]. In other words 51% of the energy mix is based on fossil fuels. Poland, as being the largest country to be studied has the highest coal consumption (265734 TJ). Heating accounts for 66% of the energy consumption in the region [7].

Hardware

The housing stock in the project countries is assessed as being of a relatively low quality. This is mostly true in Hungary - where 10-12 % of the housing stock consists of housing units qualified as ” dwellings without comfort” and Poland - where households spend 12% of their budget on energy, compared to an average 4% across the EU. Exceptions from the general trend are Slovenia, Slovakian Republic and most of all Czech Republic, where the quality of the housing stock is assessed as good [6]. The age profile of the building stock in Central /East EU characterizes by 48% build between 1961-1990, 35% before 1960 and 17% between 1991-2010 [1], p. 36. A common feature is the problematic panel buildings housing stock, inherited by the Socialistic era.

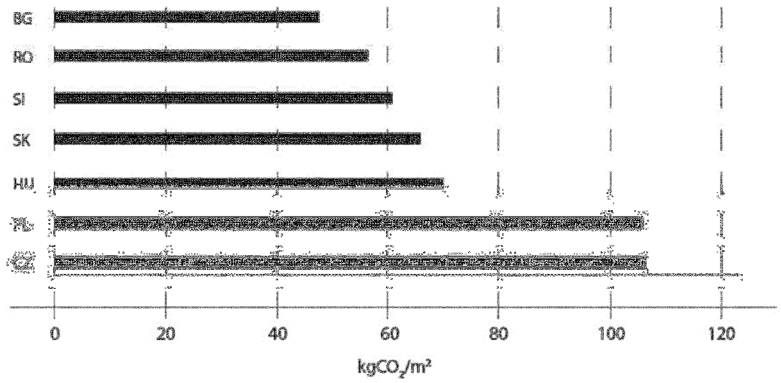

Figure 2: CO_2 emission per useful area in the seven target countries [1], p. 44.

Further common topic is the ownership - there is a high percentage of privately owned dwellings- between 60% (Slovak Republic) and 97% - Bulgaria, which is a considerable obstacle to a common housing strategy.

Software

Overall there is a lack of awareness on the topic of EE and the popular perception of it is of a rather exotic domain, irrelevant to the concerns of the day. No official information strategy exists in any of the countries. The most coherent campaign concerning EE, conducted in the project countries is EPBD [8]. Formally Certificates for the Energy Performance (CEP) are overall introduced and are partly required for new buildings, however no penalties exist in general if CEP requirements are not met and therefore monitoring is rather insufficient. Generally a need for a capacity building is detected as well. Special education for quality experts concerning CEP exists, however there is lack of experts both among high qualified professions- engineers, architects and among construction workers.

Orgware

There are many institutions - organizations and government structures involved in EE and especially EPBD [5, 8]. However, as lower the authority level is as worse the coordination and the actual implementations of the directives becomes. Naturally, EE related structures, even though existing from relatively short period of time automatically inherits the country's society system's weak and strong features. A positive trend is the forming of Housing association as legal bodies, acting in the housing market, which is an already advanced process in some of the countries- Bulgaria, Romania.

Finware

The lack of interest and awareness hampers the developing of efficient financial network. Though many financial incentives exist, the overall assessment is of their implementation to be rather isolated. Banks are still rather reluctant to cooperate because usually projects are small and risky. Busyness is as well reluctant to invest because pay-back horizon usually extends over 5 years which is the reasonable investment border. The individual consumer often prefers the social benefits of a new kitchen instead of taking advantage of some abstract saving opportunity which needs a life-cycle to be implemented. Slovenia is the only country where adequacy of funding schemes is assessed as good.

Ecoware

Surprisingly enough only Slovenia – the country with the most positive feedback in the different topics is not likely to meet its Kyoto and Non -ETC targets. However, the country can take advantage of the allocation system. All of the countries retain high rates of energy intensity, compared to the rest of EU with Bulgaria holding the highest. However, the project countries used to be even more energy intensive before the political changes of the90s which led to collapse of economy and industry and consequently to shrinking of energy intensity. Unfortunately the project countries report gradual rise in energy intensity after the changes until nowadays when some of them are close to the levels of 1990. Rather problematic topic

remains transport, where the amount of cars has multiplied in the last decades. Slovenia is an exception again - reforms in the transport sector in Slovenia have progressed.

Polware

Political commitment remains a strong barrier towards EE. None of the project countries has a long term political strategy on EE. With the exception of Slovenia the topic of EE receives overall not only minor interest, but even a negative connotation in Czech Republic, Hungary and Poland. There are two main reasons behind this disappointing attitude- the high cost of EE and concerns for energy security. If EE investments are generally assessed in EU as rather expensive, even more is this true for Central/ East Europe, where standard of living remains still much behind of that of South Europe and much more - of North/West Europe. Especially in the case of Bulgaria and Romania which still have a Gross domestic product (GDP) way below the world's average. Not surprisingly, the highest GDP among the project countries belongs to Slovenia. As for the second major reason – fear for stability of the grid – it stems most of all from the common Socialistic past and dependence from Russia. The project countries, especially Poland, prefer to put effort into securing energy supplies, most often by developing coal and nuclear power plants. Romania has the largest amount of natural resources (mainly coal) and therefore it is the country, the least concerned about its energy security. This, alongside with the urgent need of renovation of a large amount of the housing stock could provide conditions for leap- frogging. Slovenia is the only project country which has received positive feedback from experts of EE of making good use of environmental and energy taxation policy.

Discussion and proposal of a replication strategy

Themes the project countries have in common:

- an urgent need of investments in energy efficiency and renewable energy sources
- socialistic past of similar length (40-50 years), impact and consequences
- challenges of sustainable development receive similar level of attention in the project countries
- political activities aiming to conform to the European Union sustainable development directive

The identified common themes described above help to define certain barriers to investments in EE projects. These barriers can be divided into three main categories: institutional, economic, and capacitive.

Institutional barriers

The lack of transparent and trustworthy organizational system is a major issue in the project countries. Cooperation is lacking among the different ministries and agencies involved in energy policies at both the national and local level. This is the result of stronger involvement with and allegiance to the policies of parties they belong to, rather than to the national policies. Research shows that there exists a lack of secondary legislation and operational instructions, tools, standards, and procedures necessary to implement primary legislation.

Even more burdening are the numerous bureaucratic obstacles placed on new projects, such as non-transparent administrative and authorization procedures. There is lack of public procurement guidelines for the acquisition of energy efficient equipment and the request of provision of energy services to public entities, and there is inefficient or limited use of public tendering processes for energy efficiency and renewable energy projects. In addition, unresolved property issues in multi-residential apartment buildings and the significant fragmentation of land property limit profoundly the feasibility of energy efficiency investments in the housing sector at the scale of the individual resident.

Economic barriers

A number of economic policy approaches currently used in project countries need to be reviewed and improved. Traditional routes of state intervention in price formation have been through creating artificially low tariffs for final customers and cross subsidies between customer segments. Such incentives limit the profitability of energy efficiency projects and create an unfavorable investment climate. Environmental costs of the energy supply are often not taken into account, and this inhibits evolution towards more responsible behaviour of the final customer. Most of the major energy companies are public owned, causing an unresolvable conflict of interest between profitability and pursuit of political benefits through popular, social pricing policy. The funding system also still requires a lot of elaboration. Availability of public funds is insufficient, and the developed premium tariffs are often not operational and of a limited extent since they apply only to certain technologies or have restrictive requirements. EE funds, if they are operational, have limited resources. Alternative measures such as dedicated credit lines providing soft loans, tax exemptions, or support schemes for third-party financing are often not in place. Banks themselves do not contribute to mitigating the problem - they apply high interest rates to medium and long term loans and restrictive requirements for collaterals. As a consequence of all these economic barriers, the size of the energy efficiency and renewable energy projects remains rather small. This results in high evaluation and transaction costs per project.

Capacitive barriers

Inefficiency in policy and the economy results in a lack of awareness and interest in energy efficiency issues in the societies of the project countries. Sustainable development is still regarded as a rather exotic domain, foreign to the very initial concerns of everyday life. Consequently, a societal lack of interest diminishes the value of sustainable development as an issue in political strategies. A lack of professional skills is reported with all stakeholders involved in identification, development, financing and implementation of energy efficiency and renewable energy projects:

- Policy level: insufficient political commitment to implement the necessary policy reforms and lack of qualified human resources among local authorities who are to realize the identified projects [9, 10].

- Economic level: Lack of experience within commercial banks in financing energy efficiency andd renewable energy projects and lack of knowledge for possible economic benefits arising from energy efficiency and renewable energy projects.
- Societal level: Lack of training and educational opportunities for conducting energy audits.
- Failure to identify attractive project opportunities and preparing bankable project proposals.
- Consumer level: Energy is regarded more as a public service than a valuable good, which is difficult to change unless this implies a tangible improvement of the living standard.

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